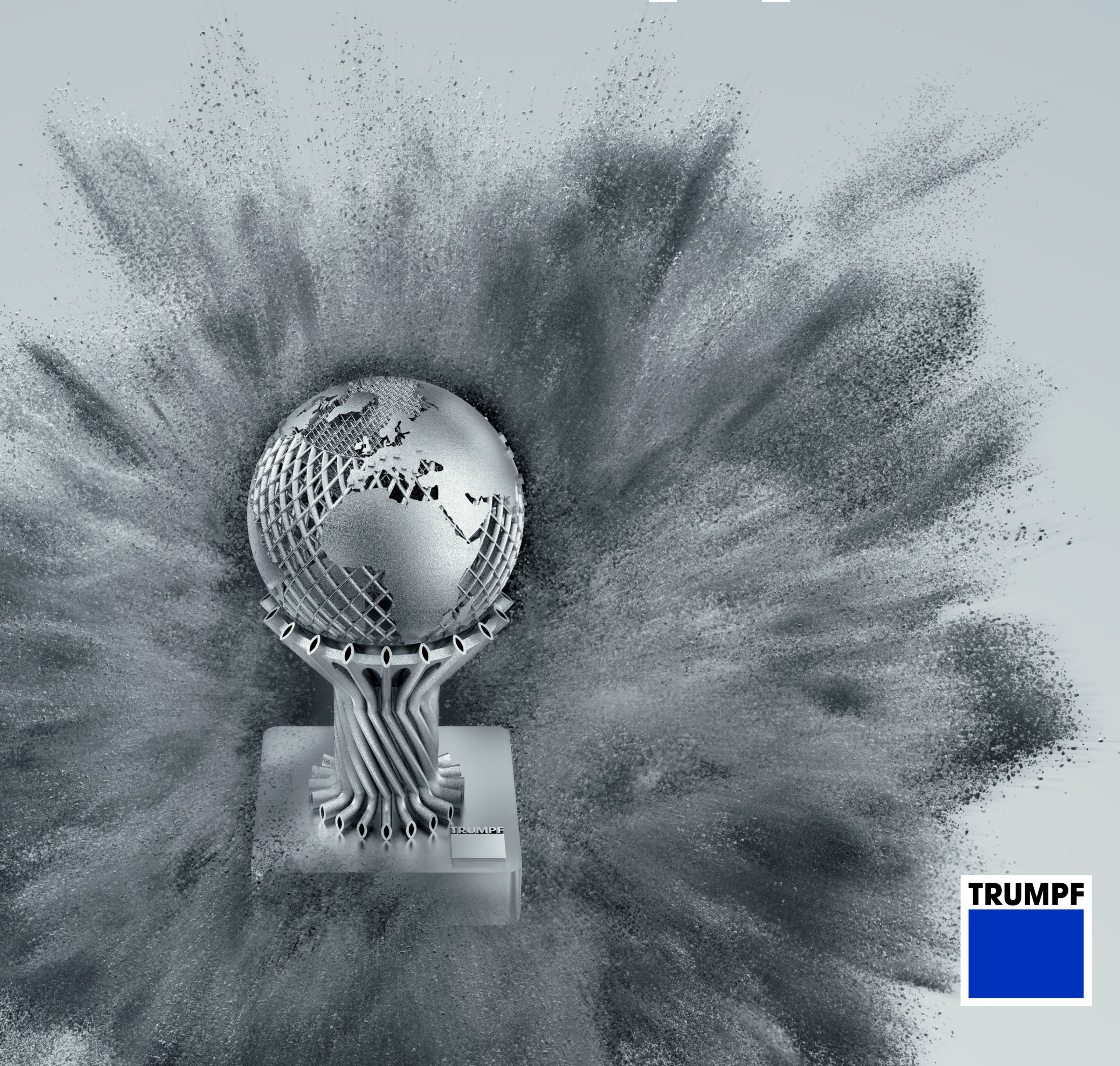
TruPrint 2000
Copper



TRUMPF

Contents

version 2025/03/03
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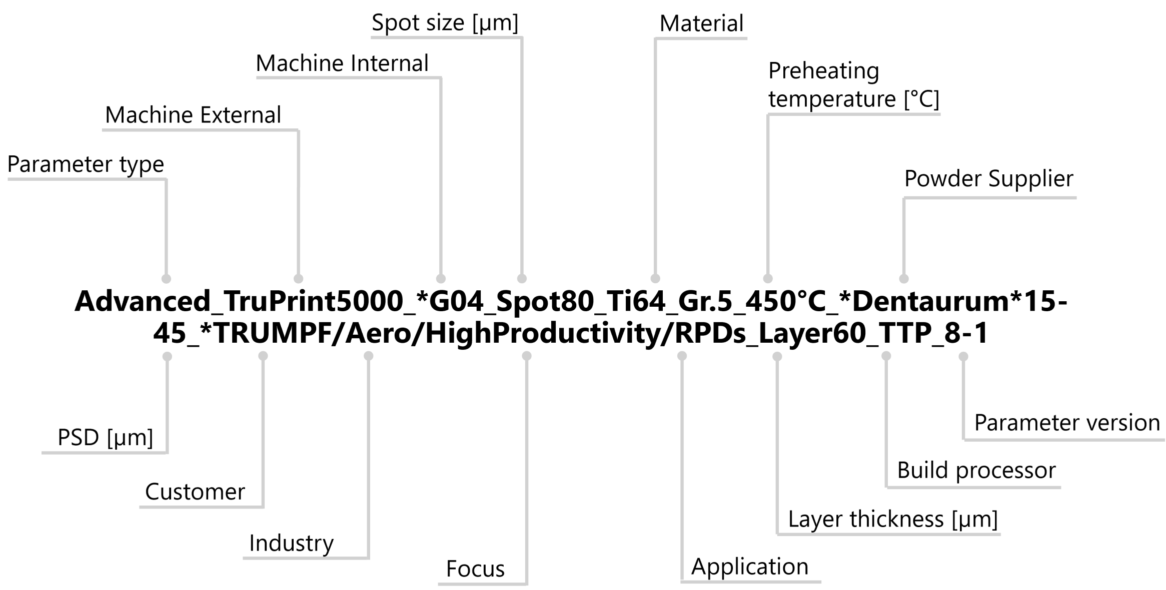
1. Introduction to parameters at TRUMPF AM

This document details the parameter set for processing Copper using the TruPrint 2000. The set encompasses all materials within this material group, various layer thicknesses, and types of data preparation software. TRUMPF recommends using TruTops Print for data preparation. Each set may include basic and advanced parameters. Basic parameters are intended as a starting point for development. They are suitable for test geometries, but are generally not recommended for direct part production. Advanced parameters are refined settings suitable for actual component production.

Additionally, the document provides detailed information about the powders used to develop these parameters. Other powders, similar to those mentioned, are also suitable for production on our systems.

We are happy to assist you further in parameter development and optimization to meet your part requirements. Please reach out to us for support.

How do parameter names work at TRUMPF Additive Manufacturing?



***optional possibilities to differ the parameter portfolio**

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2. Available Parameters

Material	Machine	Parameter type[1]	Spot [µm]	Preheating temperature[2] [°C]	Layer thickness [mm]	Build processor[3]	Build rate[4] [cm^3/h]
CuCr1Zr	G05	Advanced	55	23	0.04	TTP	28.3

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3. Powder Information

Please contact additive.manufacturing@de.trumpf.com for direct contact to powder manufacturers.

Material	Supplier	Powder name	PSD [µm]	Supplier ID
CuCr1Zr	Metalpine	MET CuCr1Zr	20-63	MET-CuCr1Zr 020-063 WB2.5 5.0kg HD-PE Bottle 2.5l (5kg)

4. Parameter details

4.1. Advanced_TruPrint2000_Spot55_500W_CuCr1Zr_Layer40

Powder information		Material properties	
Material	CuCr1Zr	**Build rate[4] [cm³/h]**	28.3
Supplier	Metalpine	**Relative density[5] [%]**	99.9
Powder name	MET CuCr1Zr	**Average roughness[6] R_a [µm]**	8.3
Supplier ID	MET-CuCr1Zr 020-063 WB2.5 5.0kg HD-PE Bottle 2.5l (5kg)	**Average roughness[6] R_z [µm]**	43.6

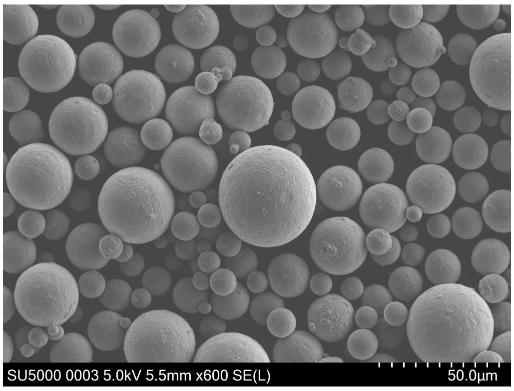

Figure 1: CuCr1Zr powder by Metalpine. PSD: 20-63 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	197.7 – 207.3	200.0 – 206.0	157.6 – 230.8	**Samples**	60
Tensile strength [MPa]	265.1 – 280.7	240.0 – 246.0	211.8 – 285.6	**Build jobs**	15
Elong. at break [%]	35.1 – 50.7	45.3 – 50.7	33.1 – 67.3	**Machines**	4

Hardness[13]	
Brinell [HB]	76.6 – 81.4

Physical properties	
Electrical conductivity [%IACS]	21.6 – 22.2
Thermal conductivity[14] [W/mK]	0.0

CuCr1Zr: AM_W

Process description[7]: 500°C/6h, Ar

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	360.3 – 554.1	336.8 – 480.2	208.5 – 573.3	**Samples**	61
Tensile strength [MPa]	473.6 – 609.2	401.4 – 516.6	262.3 – 647.5	**Build jobs**	3
Elong. at break [%]	14.9 – 24.5	16.6 – 23.8	13.6 – 29.2	**Machines**	3

Hardness[13]	
Brinell [HB]	153.9 – 172.5

Physical properties	
Electrical conductivity [%IACS]	79.9 – 80.5
Thermal conductivity[14] [W/mK]	0.0

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[1] Basic parameters: starting point for development, generally not recommended for direct part production. Advanced parameters: refined settings, suitable for actual component production.
[2] Describes the preheating temperature of the build plate. A generic value of 23°C is stated, if no active preheating was used. The actual value depends on the climatic conditions of the surrounding.
[3] TTP: TruTops Print, Mat: Materialise, Cam: Cambridge, Oqt: Oqton
[4] Calculated melting rate with maximum amount of lasers; effective melting rate may differ depending on the application.
[5] ASTM E 1245:2003. Measurement of the relative density was performed for specimens with cubic geometries. Values can differ for other geometries and sizes.
[6] Arcording to DIN EN ISO 21920-2-01:2022 with used measurement length of 4,8 mm
[7] The process description is read as follows: Example: 650°C/10min,850°C/10min,1010°C/30min,Air; 590°C/2h,Air; 590°C/2h,Air: 1. Heat treatment cycle: (1. temperature/1. holding time at temperature, 2. temperature/2. holding time, quenching medium); 2. heat treatment cycle (temperature/holding time, quenching medium); 3. heat treatment cycle (temperature/holding time, quenching medium). We recommend that titanium is heat treated under vacuum.
[8] Values are stated as intervals from 3σ to the left of the mean to 3σ to the right of the mean. This ensures that, statistically, 99.73% of the process output meets customer requirements. For sufficiently many data points, a full process capability analysis was performed and intervals are stated such that a CPK of 1.33 was achieved.
[9] DIN EN ISO 6892-1:2017, DIN 50125:2016
[10] DIN EN ISO 22674
[11] ASTM E8
[12] The average values could include a combination of different build jobs on the same machine type, different powder manufacturers and different inspection orientations.
[13] DIN EN ISO 6506-1:2015
[14] Calculated from electrical conductivity using Wiedemann Franz Law: $\kappa/\sigma = LT$, with thermal conductivity κ [W/mK], electrical conductivity σ [S/m], Lorenz number $L = 2.44 \cdot 10^{-8}$ WΩ/K², temperature T [K].

Further test procedure details are available on request.

The component properties obtained were exclusively derived from the combination of suitable powder, the TRUMPF TruPrint and the parameter sets, while observing the current operator's manual.

The data in this technical data sheet and other information are up to date. They alone do not provide a sufficient basis for designing components. The suitability of a component for a particular application cannot be guaranteed by this information. The details in this data sheet are intended exclusively for information purposes and do not constitute an agreement on certain qualities. The TRUMPF warranty only covers agreements specified in the delivery contracts.

The manufacturer of a component is responsible for determining the properties and suitability for any use of the component. They are also responsible for respecting any potential property rights and current legislation and regulations.

As a result of continuous improvement processes in place at TRUMPF, the information in this data sheet is subject to change without prior notice. Errors are excepted.

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